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114-14.T 15

British # 837,668

JUN, 1960

837,668 COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

Fig.1

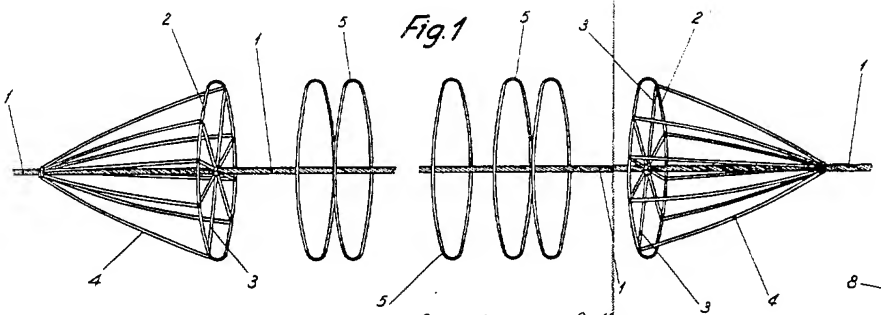


Fig.2

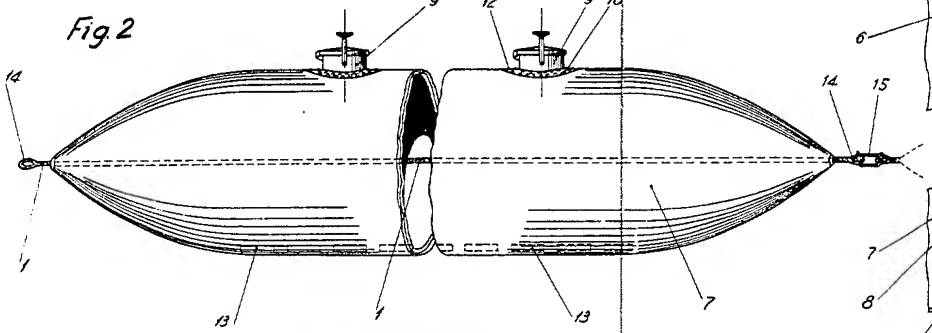


Fig.3

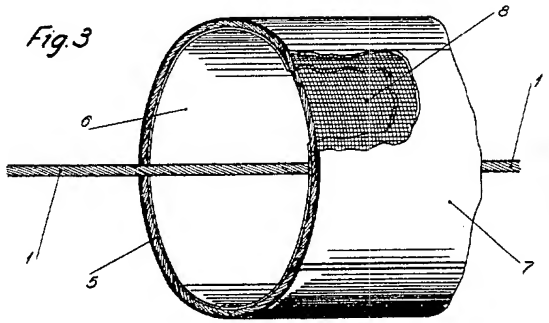


Fig.4

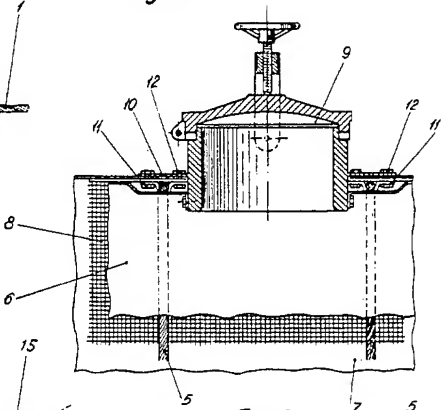


Fig.5

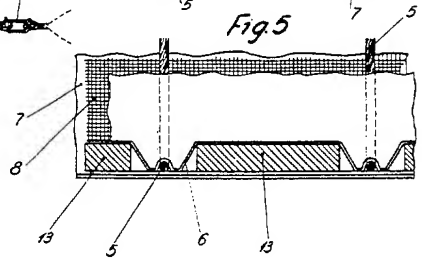
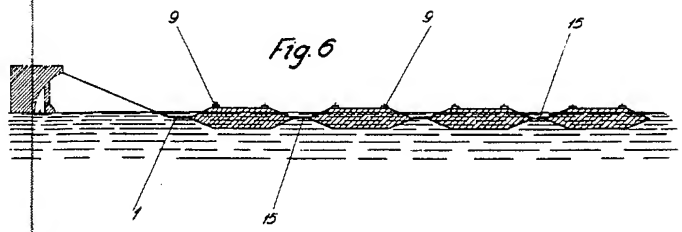


Fig.6



PATENT SPECIFICATION

DRAWINGS ATTACHED

837,668

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International Classification:—**B63b.**

COMPLETE SPECIFICATION

Procedure for the Construction of a Floating Storage Tank for Sea and River Transport of Liquids, especially Petroleum and other Combustibles

I, LUIS ESTEVE LLAURADO, a Spanish citizen, of Calle Alcoy, 17 - Barcelona, Spain, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to floating storage tanks adapted for the transport by sea and river of liquids, especially petroleum and other combustible fluids. The tanks of the invention may be towed by any kind of ship, and may also form part of a train of tanks similarly towed.

The present invention is a method of constructing floating storage tanks for sea and river transport of fluids, especially petroleum and other combustible fluids, comprising constructing a flexible framework of hoops and stays about an axially disposed haulage cable and connecting at least the end hoops and the stays directly or indirectly to the cable, covering said framework internally and externally with coverings of impermeable canvas or other impermeable fabric immune to attack by the fluid transported, securing to the framework one or more hatchways for loading or inspection of the tank interior, and securing ballast weights in the tank interior opposite the hatchway or hatchways to stabilise the tank on flotation and ensure that the hatchway or hatchways always remain uppermost when the tank is afloat.

An embodiment of the invention will now be described by way of example, with reference to the accompanying drawing, in which:—

Fig. 1 is a side elevation of the framework of a storage tank according to the present invention;

Fig. 2 is a side elevation of a storage tank constructed about the framework shown in Fig. 1;

[*Price 3s. 6d.*]

Fig. 3 is a perspective view showing the structure of the tank covering or skin;

Fig. 4 is a detail view showing the construction of one of the hatchways or loading and inspection openings;

Fig. 5 shows one arrangement for stabilising ballast in the bottom of the tank; and

Fig. 6 is a diagrammatic illustration of a floating train made up from a number of storage tanks according to the invention and being towed by a ship.

Referring to the drawing, the storage tank comprises a framework (Fig. 1) arranged symmetrically in relation to an axis materialised by a haulage cable 1. The framework comprises a pair of flexible wire rope hoops 2, one situated at a convenient distance from each end of the tank and maintained concentric with the haulage cable 1, by means of flexible wire rope stays 3 the ends of which are soldered or welded respectively to the haulage cable 1 and to the flexible hoops 2. Several flexible wire rope stays 4 are joined at one end to the hoops 2 and at the other end to the haulage cable 1 adjacent the respective extremities of the latter, thus forming strong conical structures which form the prow and the stern of the storage tank. In order to avoid the subjection to strain of these convergent stays 4 before the haulage cable 1 is strained, they are made longer than is theoretically necessary, which moreover necessitates that the casing or skin that covers them takes on a slightly ogival form due to the internal pressure. Flexible wire rope hoops 5 are distributed along the space between the two cones, these hoops 5 either not being joined directly to the rest of the structure, or being joined at both front and rear to the axial cable by means of wire ropes set at 45° or more. The hoops 5 are destined to restrain expansion of the receptacle.

The framework described is covered in-

ternally and externally at 6 and 7 respectively with sheets of strong impermeable canvas which is not attacked by hydrocarbons, there being interposed between each two adjacent layers of canvas an auxiliary metallic wire net frame 8 (Fig. 3) which efficiently neutralises nearly the whole of the internal pressure. These covering sheets extend in alternate layers with the aforementioned interposed netting, the outer layers or coverings consisting of as aforesaid impermeable canvas or of synthetic rubber, plastic or similar material as desired. With the object of maintaining the positional relationship of the intermediary hoops 5, the latter may be held in position by suitable means from the canvas coverings 6 and 7 themselves.

In order to load and unload the liquid and to provide a means of access to the interior of the tank, one or more hatchways 9 (Fig. 4), which may be hermetically closed, are firmly secured by means of a flange 10 to two of the intermediate hoops 5, the canvas coverings 6, 7 and the wire netting 8 being securely fastened between said flange 10 and an annular plate 11 by means of bolts and nuts 12 or by other similar or suitable means.

Flotation stability of the tank to ensure that the hatchways 9 remain permanently and constantly in the highest position, is attained by locating along the bottom of said tank, preferably between the canvas coverings 6 and 7 of the casing (Fig. 5), ballast 13 in the form of blocks of lead or of other material of high specific gravity which are secured in place by sewing or firmly adhering them to the canvas coverings 6 and 7. To facilitate towage, rings 14 are spliced at each end of the haulage cable 1, and, if required, shock absorbing springs are included to avoid abrupt traction effects.

By means of these rings 14 together with appropriate shackles 15, a transport train may be formed composed of a number of tanks (Fig. 6) that may be towed by a ship.

It is evident, that, in view of their construction, the tanks will acquire a certain pliability when empty, so that their volume is susceptible to considerable reduction, and will occupy very much less space when stored than that required by rigidly constructed tanks of the same effective capacity.

WHAT I CLAIM IS:—

1. A method of constructing floating storage tanks for sea and river transport of fluids, especially petroleum and other combustible fluids, comprising constructing a flexible framework of hoops and stays about an axially disposed haulage cable and connecting at least the end hoops and the stays directly or indirectly to the cable, covering said framework internally and externally with coverings of impermeable canvas or other impermeable fabric immune to attack by the fluid transported, securing to the framework one or more hatchways for loading or inspection of the tank interior, and securing ballast weights in the tank interior opposite the hatchway or hatchways to stabilise the tank on flotation and ensure that the hatchway or hatchways always remain uppermost when the tank is afloat.

2. A method as claimed in claim 1 comprising joining the two end hoops to the cable at a suitable distance from the respective extremities of the latter by means of radial and oblique or diagonal stays to give an approximately conical form to the extremities, i.e. the prow and stern, of the otherwise substantially cylindrical tank.

3. A method as claimed in claim 1 or 2, comprising interposing metallic wire netting between the impermeable coverings of the framework to reinforce the tank wall against internal pressures.

4. A method according to any preceding claim, comprising fitting rings and auxiliary shock-absorbing devices, together with the necessary shackles, at the extremities of the haulage cable to facilitate towage of the tank.

5. A floating storage tank for sea and river transport of fluids, especially petroleum and other combustible fluids, when constructed in accordance with the method claimed in any of claims 1 to 4.

6. A floating storage tank substantially as hereinbefore described with reference to the accompanying drawing.

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